

951068

**Jennison-Wright Corporation
Interim Remedial Action
Completion Report
Granite City, Madison County, Illinois**

July 2013

Prepared for:

ILLINOIS ENVIRONMENTAL PROTECTION AGENCY
1021 North Grand Avenue East
Springfield, Illinois 62794-9276

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ecology & environment engineering, inc.

International Specialists in the Environment

33 West Monroe Street, Chicago, Illinois 60603
Tel: 312/578-9243, Fax: 312/578-9345

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List of Acronyms

ACM	asbestos-containing material
AST	aboveground storage tank
BAP	benzo(a)pyrene
BESI	Bodine Environmental Services, Inc.
bgs	below ground surface
CAC	corrective action contractor
COPC	chemicals of potential concern
cPAH	carcinogenic polynuclear aromatic hydrocarbon
CUO	clean-up objective
DNAPL	dense non-aqueous phase liquid
DO	dissolved oxygen
E & E	Ecology and Environment, Inc.
EE/CA	Engineering Evaluation/Cost Analysis
EEEI	Ecology and Environment Engineering, Inc.
EFS	Environmental Field Services, Inc.
EPA	U.S. Environmental Protection Agency
ESD	Explanation of Significant Difference
GAC	granular activated charcoal
gpd	gallons per day
gpm	gallons per minute
HASP	health and safety plan
HDPE	high density polyethylene
HEPA	high-efficiency particulate air (filter)
HRC®	hydrogen release compound
Illinois EPA	Illinois Environmental Protection Agency
IRACR	Interim Remedial Action Completion Report
LNAPL	light non-aqueous phase liquid
LRA	limited remedial action design report

List of Acronyms (Cont.)

MCL	maximum contaminant level
µg/kg	micrograms per kilogram
µg/L	micrograms per liter
mg/L	milligrams per liter
NAPL	non-aqueous phase liquid
NPDES	National Pollutant Discharge Elimination System
NPL	National Priorities List
O&M	operation and maintenance
ORP	oxidation reduction potential
OSHA	Occupational Health and Safety Administration
OU	operable unit
OVA	organic vapor analyzer
PCB	polychlorinated biphenyl
PCOR	Preliminary Close-Out Report
PCP	pentachlorophenol
PWP	project work plan
QA/QC	quality assurance/quality control
QAPP	quality assurance program plan
RAO	remedial action objectives
RAP	remedial action plan
RI	remedial investigation
ROD	Record of Decision
SVOC	semi-volatile organic compound
TACO	Tiered Approach to Corrective Action Objectives
TCDD	2,3,7,8-tetrachlorodibenzodioxin
TEF	toxicity equivalency factor
TEQ	toxicity equivalent
USGS	United States Geological Survey
UST	underground storage tank
VOC	volatile organic compound
WWTP	(Granite City Regional) Waste Water Treatment Plant

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Introduction

This document was prepared for the Illinois Environmental Protection Agency (Illinois EPA) under Professional Services Agreement Number FLS-1304 between Illinois EPA and Ecology and Environment, Inc. (E & E). Ecology & Environment Engineering, Inc. (EEEI), E & E's wholly owned, Illinois-licensed engineering subsidiary, developed this report. Both business entities, E & E and EEEI, are referred to within this document. In accordance with tasks specified in E & E's October 2010 Budget Revision Estimate, E & E was directed to develop an Interim Remedial Action Completion Report (IRACR) for the Jennison-Wright Corporation Superfund site (the site) located in Granite City, Madison County, Illinois.

The Illinois EPA is the lead agency for this site, and the United States Environmental Protection Agency (EPA) is the support agency. Illinois EPA held the construction contract with the selected corrective action contractor (CAC), Bodine Environmental Services, Inc. (BESI), of Decatur, Illinois. EEEI performed third-party monitoring of the CAC during implementation of Professional Engineer-sealed engineering design drawings and specifications. The CAC's Health and Safety Plan (HASP) was prepared by BESI following specifications developed by EEEI and Occupational Safety and Health Administration (OSHA) requirements.

1.1 Interim Remedial Action Completion Report Objectives

The Interim Remedial Action Completion Report (IRACR) provides documentation that the remedial action was constructed in accordance with the Record of Decision (ROD), as modified, as well as Illinois EPA-approved remedial design plans and specifications. This (IRACR) summarizes the remedial actions performed at the Jennison-Wright Corporation Superfund site from the years 2003 through 2009 as well as modifications to the system that were made from 2009 through 2011. Development of this IRACR is based on *Closeout Procedures for National Priorities List Sites*, EPA 540-R-98-016 (EPA 2000; OSWER Directive 9320.2-09A).

Three of the major milestones related to implementation of a remedy at a Superfund site are:

- Construction completion
- Completion of interim remedial action
- Site completion

The achievement of construction completion is documented in the Preliminary Close-Out Report (PCOR), the completion of an interim remedial action is documented in an Interim Remedial Action Report (also referred to as an Interim Remedial Action Completion Report), and site completion is documented in the Final Remedial Action Report. The need for both an Interim Remedial Action Report and Final Remedial Action Report occurs when the physical construction of the remedy is completed in a relatively short timeframe, but the achievement of remedial action objectives (RAOs), such as achieving maximum contaminant levels (MCLs) in groundwater, may not occur until a number of years after physical construction of the remedy is complete.

The completion of the last response action at a site determines when the site becomes eligible for construction completion. The construction completion milestone is achieved when:

- Physical construction of the remedy (i.e., construction of the treatment plant, pumps, and extraction wells) is complete
- The treatment system is operating as intended, and any future adjustments are expected to be minimal
- A pre-final inspection for the remedial action has been conducted
- The designated regional EPA official signs the Preliminary Close Out Report (PCOR) and sends a hard copy to EPA headquarters.

The PCOR for the Jennison-Wright site was signed on September 28, 2009. The Interim Remedial Action report is typically prepared within one year of achievement of construction completion status and after necessary adjustments to the remedy are made. For the Jennison-Wright site, the completion of the Interim Remedial Action report was delayed due to contractual issues.

Site completion occurs when no further response is required at the site, cleanup goals have been achieved, and the site is deemed protective of human health and the environment. Once site completion is achieved, the site becomes a candidate for deletion from the National Priorities List (NPL).

1.2 Document Layout

This report is composed of seven sections. Section 1 presents the introduction and objectives for development of the IRACR, and Section 2 summarizes background information regarding remedial actions at the site. Section 3 details the remedial action implementation and construction activities. Performance standards and construction quality control used by EEEI during construction activities are detailed in Section 4, and operation and maintenance activities are described in Section 5. Section 6 summarizes costs and performance, and Section 7 provides the references used in this report.

Appendix A provides EEEL record drawings from the civil and mechanical installations at the site. The original electrical drawings have been included but were not updated to reflect installed conditions because they were produced by a subcontractor, not EEEL. Record drawings were completed from field observations and BESI-provided data.

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Remedial Action Background

2.1 Site Description

The Jennison-Wright site, a 20-acre abandoned wood-treating facility, is located at 900 West 22nd Street in Granite City, Illinois, approximately 6 miles northeast of downtown St. Louis, Missouri (see Figure 2-1). The site is approximately 2 miles east of the Mississippi River, in Section 13, Township 3 North, Range 10 West, Madison County, Illinois. The area surrounding the site is a mixed residential-industrial neighborhood. The site is bisected by 22nd Street, with former storage areas for untreated and treated wood located north of this street and the former facility process areas located south of the street. An Illinois-American Water Company waterworks facility is immediately north of the site. This facility provides drinking water and wastewater treatment services for the surrounding area. Railroad tracks border the site along its entire eastern boundary, and an alley and residences border the site along its entire western boundary.

The site is an abandoned facility that treated wooden railroad ties and wood blocks using creosote, pentachlorophenol (PCP), and zinc naphthanate. Jennite®, an asphalt sealant, was also manufactured at the site. The manufacturing process areas, a lagoon area, a pit for asphalt waste, and an area with buried waste contaminated with PCP and dioxin were located on the southern portion of the site, south of 22nd Street. The northern portion of the site, north of 22nd Street, was used to store raw lumber and to dry and store treated railroad ties and wood block. The southern portion of the site contained both an aboveground and buried railcar that had been used to dispose of waste creosote and PCP. Several contaminated soil stockpiles were located across the site. One such area, located off the northeast corner of the site, was called Area H. Area H, the 22nd Street lagoon, and the Jennite® pit were on-site disposal pits where manufacturing wastes were dumped. Other features in the southern part of the site included the transite building, the Jennite® building with two storage silos, the tank farm (including the two railcars), the creosote process area (green building and concrete basin), the PCP process area, sawmills, office, and other operations buildings.

A more detailed site history can be found in previous documents pertaining to the Jennison-Wright site, which are listed in the reference section, Section 7 of this document and are part of the Administrative Record for the site.

2.2 Summary of Previous Site Investigations

In 1988, Woodward Clyde Consultants (WCC) completed a site assessment as part of a Judicial Consent Decree between the Jennison-Wright Corporation and the State of Illinois signed on January 15, 1986. The results of the site assessment indicated that soil underlying the site consisted of seams of clayey and sandy soils within the upper 25 feet. Sandy and gravelly soils were encountered below 25 feet extending to bedrock. Groundwater was encountered at a depth of approximately 17 feet below ground surface (bgs) and was found to flow in a southwesterly direction across the site.

Subsurface contamination was found by WCC in both soil and groundwater at the site. Soil contamination was noted through the unsaturated zone to groundwater, near the 22nd Street lagoon, the Jennite® pit, and the PCP process area. These areas are located south of 22nd Street. Soil contamination in the remainder of the site was found at depths ranging from less than 1 foot to 5 feet bgs. Groundwater contamination was found to be localized in shallow monitoring wells in the three previously mentioned areas where soil contamination extended to groundwater, i.e., the 22nd Street lagoon, the Jennite® pit, and the PCP treatment area. Groundwater contamination was not found in the one intermediate or the four deep wells at the site.

In 1991, the Illinois EPA completed six soil borings at the site in order to determine the horizontal and vertical extent of contamination in three on-site areas. Two borings were completed in each area of concern: the northeast corner of the site (which encompasses a large area including Area H) the 22nd Street lagoon, and the Jennite® pit. Each boring was sampled continuously and advanced to or just below the water table. Soils were logged by a geologist, and each sample interval was screened for organic vapors using an organic vapor analyzer (OVA). No soil samples were submitted to a laboratory for chemical analysis.

Soil samples from the six borings showed visible signs of contamination, as well as discolored oily groundwater contamination. Borings completed in the northeast corner and the 22nd Street lagoon exhibited gross soil contamination throughout the entire boring length, with OVA meter readings between 100 and more than 1,000 units. Contamination was visible at the surface at the Jennite® pit, but appeared to decrease at depths of 4 to 6 feet. No OVA readings were observed until just below the water table, where soils exhibited meter readings of more than 1,000 units.

In 1993, E & E completed an engineering evaluation and cost analysis (EE/CA) for the Jennison-Wright site. The objective of the 1993 EE/CA investigation and report was to focus on the most significant sources of contamination present on-site (i.e., drums and tanks). After completion of the 1993 EE/CA report, a public meeting was held to discuss the report's recommendations, an Action Memorandum was prepared to address public comments, and technical specifications were prepared by EEEI for the interim removal action.

From July through September 1997 and in December 1997, EEEI conducted sampling in support of the preparation of another EE/CA report. The investigation included a site reconnaissance, a site survey, surface and subsurface soil sampling, a hydrogeologic investigation, a bench-scale bio-feasibility study, a structures investigation, sediment sampling, and sampling of suspected asbestos-containing material (ACM). The EE/CA investigation found:

- Dioxins/furans and carcinogenic polycyclic aromatic hydrocarbons (cPAHs) in site surface soils
- PCP in groundwater in the PCP process area and cPAHs, benzene, PCP, arsenic, 2, 4-dimethylphenol, 2-methylphenol, and naphthalene in groundwater at the 22nd Street lagoon
- Benzene and naphthalene in subsurface soil
- Structurally unsound on-site buildings and silos
- Four on-site buildings containing regulated ACM.

The results of the EE/CA were reported to the Illinois EPA in July 1999. This report formed the basis of the Jennison-Wright Record of Decision (ROD).

2.3 Previous Remedial Actions

Riedel Environmental Removal Actions

Under contract with the Illinois EPA, Riedel Environmental Technologies, Inc., of Chesterfield, Missouri, performed two removal actions at the site.

In May 1992, Riedel Environmental and its asbestos removal subcontractor, Environmental Operations, Inc. performed a removal action at the site under the direction of Illinois EPA. During this effort, the following work was accomplished:

- 22 cubic yards of ACM was removed from several piles on-site, and transported for disposal to the Litchfield/Hillsboro Landfill in Montgomery County, Illinois;
- An additional fifteen 55-gallon drums of ACM contaminated with creosote were moved into the site's transite building;
- One hundred twenty-one 55-gallon drums of unknown contents that were located throughout the site were moved to the transite building;
- 1,300 gallons of creosote-contaminated water was pumped to the west 160,000-gallon aboveground storage tank;

2 Remedial Action Background

- Creosote, tar, and contaminated soil that had migrated off-site from the Jennite pit along the site's eastern fence line were excavated and placed into three cutoff tanks located east of the site's green building for temporary storage; and
- Three cutoff tanks were covered with wooden lids and high-density polyethylene (HDPE) geomembrane liners (Riedel Environmental Services, Inc. June 22, 1992). Riedel and Environmental Operations, Inc. completed the above work on May 28, 1992.

On November 8, 1994, Riedel initiated a second removal action at the site, implementing the action recommended in the 1993 EE/CA report. During this interim removal action, Riedel performed the following work:

- A 100-foot by 150-foot crushed stone support zone was constructed just inside the fence on the south side of 22nd Street and west of the office building.
- The two 160,000-gallon aboveground tanks located south of 22nd Street and east of the office building were dismantled, cleaned, and scrapped. Five hundred cubic yards of sludge from these tanks was solidified and disposed of off-site at the Chemical Waste Management of Indiana, Inc. facility located in Fort Wayne, Indiana.
- An aboveground railcar located north of 22nd Street was dismantled, cleaned, and disposed of.
- A buried railcar located south of 22nd Street and west of the 22nd Street lagoon was excavated, dismantled, cleaned, and disposed of.
- The three cutoff tanks located in the former creosote-process area were emptied, dismantled, cleaned, and disposed of. A large amount of sludge from these tanks was solidified and disposed of off-site at the Chemical Waste Management of Indiana, Inc. facility located in Fort Wayne, Indiana.
- A total of 49,530 gallons of water removed from the three cut-off tanks and railcars was treated on-site and discharged to the Granite City Regional Wastewater Treatment Plant collection system.
- A total of 183 drums of soil was solidified and disposed off-site.
- Chain-link fencing 450 feet long was installed around an isolated area (Area H) in the far northeast corner of the site.
- An engineered cap consisting of a 40-mil high-density polyethylene (HDPE) liner and a vegetated cap was constructed over the Jennite® pit; and

- Miscellaneous debris collected from across the site was stockpiled along the eastern property fence line to the north of the transite building.

Riedel demobilized from the site during the week of March 6, 1995.

2.4 Record of Decision

The ROD specifies primary remedies for individual operable units (OUs) identified at the site. The OUs included soils and wastes, non-aqueous phase liquid (NAPL), groundwater, buildings, and miscellaneous items. The ROD, which included the selected remedies for OU1 through OU5, was signed on September 29, 1999, and is considered the final ROD for the site.

OU1 Soils and Wastes: This remedy addressed the soils that had been contaminated by past site operations and the wastes left in place when the site owner went bankrupt. The selected alternative for site wastes consisting of drip track residue and oils was to remove the waste and dispose of it at a hazardous waste facility.

The remedy for the top 12 inches of contaminated site soils was to excavate the soils and landfarm them on-site. This remedy was later modified when it was found that site contamination extended deeper and had higher contaminant concentrations than previously reported. An Explanation of Significant Differences (ESD) was appended to the ROD in 2005 to address this modification, which included excavation and off-site disposal of soil and drip track residue.

OU2 NAPL: This remedy addressed the presence of NAPL, which had been found in the northeast corner of the southern section of the site in the vicinity of the 22nd Street lagoon. The selected alternative for the NAPL was a system consisting of hot water injection and flushing to facilitate collection of this product.

OU3 Groundwater: This remedy addressed contaminated groundwater throughout the site. The most significant areas of contamination were the northeast corner of the site (Area H), the northeast corner of the south portion of the site (22nd Street lagoon), the Jennite® pit area, south of the old silos, and the immediate vicinity of the former PCP treatment process building. The preferred alternative for groundwater was enhanced in situ biological treatment using Oxygen Release Compound (ORC®) and air sparging. Natural attenuation was selected for the areas of the site where groundwater contamination was at significantly lower levels.

OU4 Buildings: This remedy addressed the various structures that remained on site, including five buildings and two silos. The selected alternative was to raze the buildings and other structures and abate ACM (pipe wrap and transite siding).

OU5 Miscellaneous Items: This remedy addressed the remaining miscellaneous items— two underground storage tanks, two aboveground storage tanks, an oil-water separator, liquids and sediments in an on-site basin, the collapsed pole barn, several sumps and pits, scattered debris piles, and steel tram rails. The selected remedy was to remove these items from the site with the emphasis on recycling materials (concrete and steel) where applicable.

These remedies were chosen to meet the remedial action objectives (RAOs) for the site. The ROD defined these RAOs as:

- Preventing current nearby residents and potential future site workers from contacting, ingesting, or inhaling on-site soil and waste materials containing chemical of potential concern (COPCs) that exceed the calculated risk-based clean-up objectives (CUOs)
- Preventing the continued release of contaminants to groundwater
- Initiating long-term groundwater restoration to less than maximum contaminant levels (MCLs)
- Abating regulated ACM present in the on-site buildings
- Removing listed hazardous waste from the site for treatment and disposal at an appropriately licensed facility
- To the extent practical, pumping NAPL from the subsurface in the vicinity of the 22nd Street lagoon and treating collected groundwater.

The initial remedial design for the remedy selected in the ROD was completed in July 2003, and on-site mobilization to start the remedial action occurred on September 24, 2004. Substantial and continuous remedial construction work began in April 2005.

Explanation of Significant Differences (ESD)

In October 2005, an ESD modified the soil remediation method from landfarming treatment in an on-site treatment unit to excavation and off-site disposal of contaminated soil. The work plan called for 1 foot of cPAH-contaminated surface soil to be removed across the site, with spot excavation of dioxin-contaminated and drip track (F032-listed) soils. Dioxin soils were to be transported for off-site treatment and disposal. The surface soils were to be segregated into soils with a cancer risk greater than 1E-4 and soils with a cancer risk between 1E-4 and 1E-5. Soils with a cancer risk greater than 1E-4 were to be transported off-site for disposal and those soils with a cancer risk between 1E-4 and 1E-5 were to be treated on-site by landfarming. Upon initiating excavation for the soil staging pad and receiving the analysis of subsurface soils, it was determined that more soil requiring off-site disposal was present than originally estimated. It was also

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determined that subsurface soil concentrations of benzo(a)pyrene exceeded the treatment criteria for landfarming. This meant there would be too much soil for the landfarm and that much of the soil would never achieve cleanup objectives. Based on soil disposal quotes obtained by BESI, it was determined that soil designated for landfarm treatment could be shipped off-site for disposal for approximately the same cost as on-site treatment. Because of this determination, an alternative to landfarming was sought. It was determined that the cheapest alternative was excavation and off-site disposal of cPAH-contaminated soils above site cleanup objectives. Given that the increased soil volume could be addressed using the same budget for landfarming a smaller volume of soil, the Illinois EPA drafted an ESD letter to amend the site ROD. It was determined that soil having a risk between $1\text{E-}4$ and $1\text{E-}5$ (i.e., soils with risk greater than $1\text{E-}5$ [see Table 2-1]) were to be shipped off-site for disposal.

A second ESD, signed in June 2009, modified the remedy to include institutional controls, the use of a different substrate to enhance in situ groundwater bioremediation, excavation of soils beneath 22nd Street, extraction and off-site disposal of NAPL from the Jennite® pit, and identification of a contingency remedy for potential additional NAPL and groundwater contamination in the Jennite® pit area. The contingency remedy, which will be implemented if necessary, would consist of installing extraction and injection wells in the Jennite® pit area. Then the NAPL from the Jennite® pit would be treated in the treatment plant for the 22nd Street lagoon that was constructed as part of the original remedy.

Table 2-1 Cleanup Objectives (CUOs)

	Proposed CUO (µg/kg)	Illinois EPA TACO Tier 1 (µg/kg)
Soil COPC		
Benzene	3,000 ^a	2,100
Benzo(a)anthracene	14,000 ^b	170,000
Benzo(a)pyrene	2,000 ^c	17,000
Benzo(b)fluoranthene	22,000 ^c	170,000
Benzo(k)fluoranthene	32,000 ^b	1,700,000
Naphthalene	27,000 ^a	8,200,000
Carbazole	954,000 ^c	None
Dibenzo(a,h)anthracene	2,000 ^c	17,000
Indeno(1,2,3-cd)pyrene	11,000 ^b	170,000
PCP	51,000 ^b	520,000
TCDD-TEF	1	None
Groundwater COPC		
Arsenic	50	50
Benzene	10	5.0
Benzo(a)anthracene	0.13	0.13
Benzo(b)fluoranthene	0.18	0.18
Benzo(k)fluoranthene	0.4	0.17
Chrysene	4	1.5
PCP	1.0	1.0
alpha-BHC	0.03	0.03
Manganese	200	None
Naphthalene	400	25
2,4-Dimethylphenol	200	140
2-Methylphenol	500	350

Source: Jennison-Wright Site Record of Decision September 29, 1999.

^a CUO is based on the construction worker scenario using 1999 TACO values.

^b CUO is based on the estimated soil saturation concentration using 1999 TACO values.

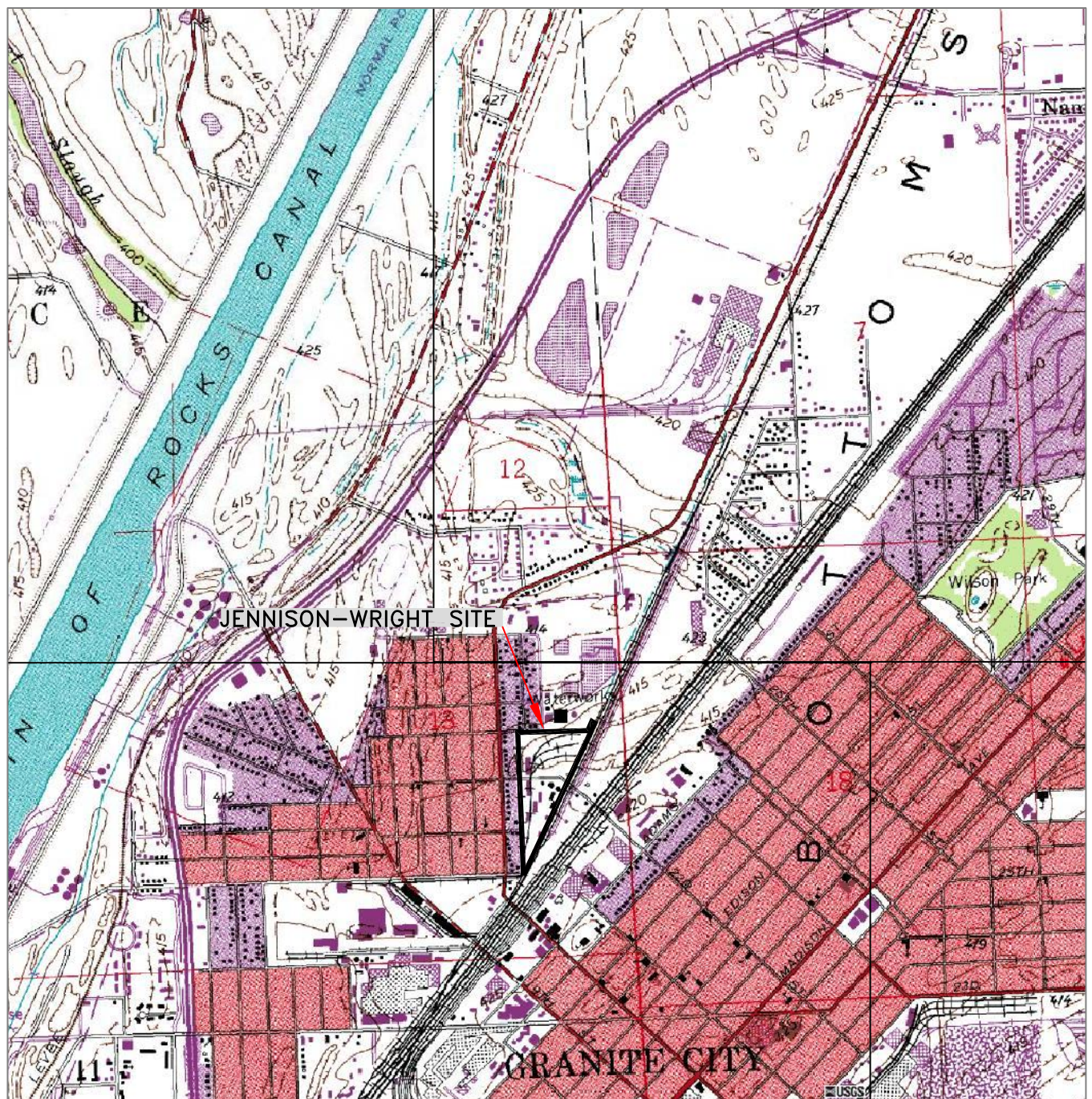
^c CUO is based on the permanent site worker scenario using 1999 TACO values.

Key:

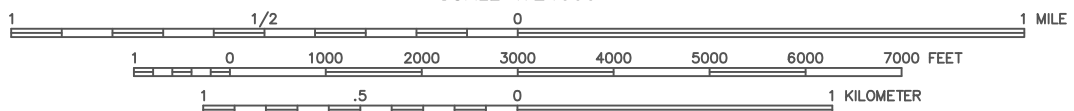
µg/L = Micrograms per liter.

µg/kg = Micrograms per kilogram .

TACO = Tiered approach to corrective action objectives.



SCALE 1:24000



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FIGURE 2-1 – SITE LOCATION MAP
JENNISON-WRIGHT SITE
GRANITE CITY, ILLINOIS

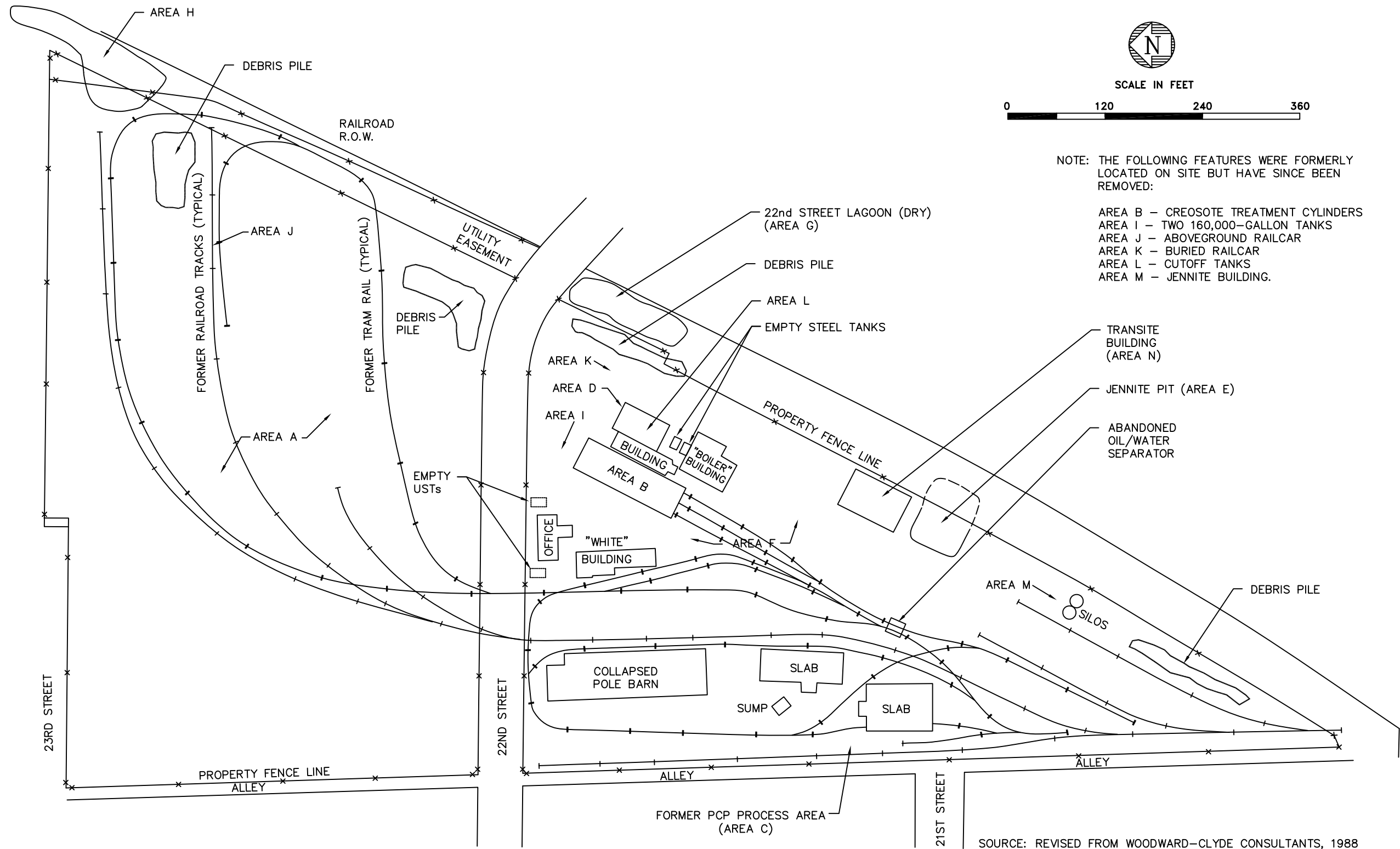


FIGURE 2-2
SITE LAYOUT MAP

JENNISON-WRIGHT SITE
GRANITE CITY, MADISON COUNTY,
ILLINOIS

SCALE	DATE ISSUED	C.A.D. FILE NO.	DRAWING NO.	REV.
1" = 100'	02/2011	Features.DWG	2	

3

Remedial Action Implementation

3.1 Construction Objectives

The objectives of the construction phase of the remediation of the Jennison-Wright site included the following:

- Removal of soils located on the north and south parcel of the property that exhibited elevated levels of cPAHs and semi-volatile organic compounds (SVOCs) above site cleanup objectives.
- Construction of the NAPL extraction and groundwater treatment plant (OU 2) for the 22nd Street lagoon NAPL plume.
- In situ remediation at the PCP process area contaminated groundwater plume.
- Complete surface restoration to address site drainage.

Remedial actions following finalization of the ROD were performed by BESI and monitored by EEI.

3.2 Remedial Action Responsibilities

Under the direction of the Illinois EPA, responsibility for design and implementation of the final remedy was shared by two organizations: the Illinois EPA and BESI. EEI provided third-party oversight of BESI on behalf of the Illinois EPA. The Illinois EPA provided overall supervision of the remedial action construction. The Illinois EPA is currently negotiating the implementation of institutional controls (e.g., restrictive covenants for the site) as specified in the ROD.

EEI was responsible for the engineering design process and various deliverables, including the Engineering Evaluation and Cost Analysis (Ecology and Environment, Inc. 1999), Remedial Design Work Plan (Ecology and Environment, Inc. 2006), Limited Remedial Action 30% Design Report (Ecology and Environment Engineering, Inc. 2002), Remedial Action Design (Ecology and Environment Engineering, Inc. 2008), and the 100% Design Specifications (Ecology and Environment Engineering, Inc. December 2008) submitted for technical engineering components of the final remedy. For third-party contracts, such as the monitoring of the CAC performed during this contract, EEI had no control over the

contractor's means or methods and was not a party to the construction contract. EEEI was on-site to monitor activities as the representative of the client, i.e., the Illinois EPA, and provided no direction regarding means or methods to the contractor. Some of the monitoring activities that were performed to track construction progress, testing, sampling, and compliance with Illinois Professional Engineer-sealed design drawings and specifications under this relationship are described below.

The remedial technologies selected to address each OU included excavation of contaminated soils, NAPL extraction using hot water injection, and in situ remediation of contaminated groundwater. In addition to these remedial technologies, institutional controls are being implemented to ensure that human health and the environment are protected. BESI was responsible for the construction activities associated with the primary remedies for the individual OUs.

3.3 Construction Activities

March 2003 to August 2003

Under contract with the Illinois EPA, BESI performed a limited removal action at the site. Tasks for the limited remedial action were presented in the Limited Remedial Action 30% Design Report (LRA) [Ecology and Environment Engineering, Inc. 2002]), which was developed based on requirements of the ROD. The LRA fit within the framework outlined in the ROD while taking into consideration the funding that was available at the time. Specifically, the Illinois EPA was granted a portion of the overall funds from the U.S. EPA designated for remedial activities at the site. Working with the Illinois EPA, EEEI identified tasks established in the ROD that could be accomplished within the funding limitations and would help to facilitate the implementation of the larger-scale items (i.e., soil and groundwater treatment) once additional funding was obtained. BESI mobilized to the site in March 2003 and performed the following work:

- A staging area, permanent decontamination pad, and water hydrant were constructed on the south portion of the site.
- Site vegetation was cleared and roots were removed by grubbing.
- On-site buildings and associated ACM, including the transite building, sumps, pits, silos, and foundations were demolished, with the debris being transported off-site for disposal or recycling.
- Debris piles and miscellaneous hazardous and non-hazardous debris scattered throughout the property was loaded, transported, and disposed. ;
- Aboveground storage tanks (ASTs), underground storage tanks (USTs), and the oil/water separator were cleaned, dismantled, and transported off-site for disposal or recycling.

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- Steel rail was removed, decontaminated, and recycled and ties were loaded, transported, and disposed in a landfill.
- Drip track residue (F032- and F034-listed waste) and dioxin-contaminated soils were excavated from beneath tram lines north of 22nd Street and staged on-site. A total of 340 tons of drip track residue and dioxin-contaminated soil was transported for off-site thermal treatment to Onyx Environmental Services, L.L.C., Port Arthur, Jefferson County, Texas.
- A total of 2,370 tons of demolition debris was transported for disposal to Milam Landfill, East St. Louis, Madison County, Illinois.
- 3,480 cubic yards of concrete were transported for recycling to Surmeier and Surmeier Aggregate Recycling, East St. Louis, Madison County, Illinois.
- 194 gross tons of scrap metal were transported for recycling to Phillip Metals, Inc., Granite City, Madison County, Illinois.
- Fifty-eight 55-gallon drums containing creosote, creosote and water, and soil cuttings, one 1 cubic yard box containing waste paint, and thirty-four 55-gallon drums containing UST/AST liquid, purge water, and purge water and soil cuttings were transported for treatment and disposal to Pollution Control Industries, East Chicago, Lake County, Indiana.
- Approximately 83,500 gallons of decontamination water were discharged to the Granite City Regional Wastewater Treatment Plant, Granite City, Madison County, Illinois, via the sanitary sewer system for treatment.
- 12,000 pounds of hydrogen release compound (HRC®) was injected at 200 points and at depths from 15 to 25 feet bgs throughout the PCP-contaminated groundwater plume.
- Repairs were made to existing monitoring wells and eight new shallow groundwater monitoring wells were installed.
- A new section of chain link fence was constructed along 22nd Street and two sections of existing fence along 22nd Street were removed, and miscellaneous repairs were made to the existing site fence.

BESI demobilized from the site on August 13, 2003. As noted above, the limited remedial effort was performed in preparation for the large-scale, long-term remedial effort that was initiated April 2005.

2004 Construction Season

During the 2004 construction season, no construction activities occurred due to lack of funding.

April 2005 to November 2005

Full-scale remedial actions for the soil component of the remedy were initiated in April 2005 to address contaminated soils throughout the north parcel and PCP-contaminated groundwater throughout the site.

Remaining debris, (e.g., railroad ties, encountered before and during screening of on-site soils) were collected, transported, and disposed. Steel rails were removed, decontaminated, and recycled. Bulldozers were used to push lifts of soil into piles that were transported by dump trucks to Milam Landfill for disposal. Areas where the ground surface was too compact for bulldozers to break up the soil were excavated using a tracked excavator. Soils that exhibited elevated levels of cPAHs and SVOCs above site cleanup objectives were excavated and transported off-site to Milam Landfill, East St. Louis. Excavation of soil continued within a given grid section until confirmation sample results showed that cleanup objectives had been met (Figure 3-1 shows the layout of the grid system established across the site). The average depth of soil excavation for the north parcel was 2.3 feet, with depths ranging from 0.75 feet to 4.93 feet. Once site cleanup objectives were met, the site was backfilled with clean soils. A drainage swale was then constructed to allow for proper storm water drainage to the northeastern corner of the property.

Additional funding was used to address the PCP process area (Area C), located on the south parcel, after the north parcel was completed. EEEI oversight personnel were on-site and monitored construction activities.

Table 3-1, Final Remedial Action, Project Chronological Data, is a tabular summary outlining the chronology of events.

- 3,451 tons of F032, F034, and dioxin soils were transported for thermal incineration to Recupere Sol, Inc., located in St. Ambroise, Quebec, Canada (2,919 tons from north of 22nd Street and 532 tons from south of 22nd Street).
- 54,017 tons of non-hazardous SVOC-impacted soils were transported to Milam Landfill located in East St. Louis, Madison County, Illinois (52,985 tons from north of 22nd Street and 1,032 tons from south of 22nd Street).
- 511 tons of wooden railroad ties were transported to Milam Landfill, located in East St. Louis, Madison County, Illinois.
- 120 cubic yards of concrete were transported for recycling to Surmeier and Surmeier Aggregate Recycling, East St. Louis, Madison County, Illinois.
- 24,355 cubic yards of backfill were placed on the northern parcel and 1,420 cubic yards of backfill were placed on the southern parcel. Topsoil came from Milam Landfill located in East St. Louis, Madison County, Illinois and Barber Hill located in Belleville, Madison County, Illinois.

- A total of 4,800 pounds of HRC® was injected at 62 points along two 240-foot long rows and at depths from 15 to 25 feet bgs in the PCP process area groundwater plume.
- Scrap metal was staged on the south property for future disposal.

Based on the round of groundwater results attained in 2005, it was determined that an isolated area of PCP groundwater contamination existed along the western side of the site. To facilitate the use of HRC® to treat the PCP contaminated groundwater in situ, the excavation of source area soils, as well as, the excavation of trenches was implemented.

HRC® was injected into the soil in Area C through steel rods using a piston pump. A steel rod fitted with an expendable tip was advanced to the proposed depth. The rod was then slightly retracted to dislodge the expendable tip from the rod. The expendable tip remained in the ground. HRC® was then pumped through the open-ended probe rod into the soil as the rod was retracted. The rod was completely removed from the soil and the open probe hole was backfilled with bentonite to form a seal between the ground surface and the HRC® injection area. Work consisted of sampling and analysis of groundwater from nine locations collected through screened open probe rods used during the initial HRC® injection process. Data were used by the engineer and Illinois EPA to assess the effectiveness of HRC® and to identify any temporal contaminant trends in groundwater at the site. Field analytical parameters were collected for dissolved oxygen (DO), pH, turbidity, specific conductance, and oxidation reduction potential (ORP).

BESI demobilized from the site on November 11, 2005. Following the 2005 removal, the north parcel, approximately 12 acres, had been remediated with the exception of deep soils in Area H and areas that were identified extending beneath the site fence onto railroad property.

2006 Construction Season

During the 2006 construction season, no construction activities occurred due to lack of funding.

August 2007 to December 2007

The full-scale remedial action resumed in 2007 once additional funding was procured. Fieldwork conducted in 2007 addressed contaminated soils on the south parcel. Removal of soils located on the south parcel of the property followed the same methods used for the north parcel. EEI was again asked to provide construction monitoring during field activities.

- A total of 42,163 tons of cPAH-contaminated soil was transported for disposal to Milam Landfill, East St. Louis, Madison County, Illinois.

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- A total of 2,056 tons of drip track residue and dioxin-contaminated soil was transported for off-site thermal incineration to Recupere Sol, Inc. located in St. Ambroise, Quebec, Canada.
- A total of 340 tons of railroad ties was transported for disposal to Milam Landfill, East St. Louis, Madison County, Illinois.
- 21,945 tons of backfill were brought to site for the south parcel from Barbier Hill, Belleville, Illinois.

October 2008 to September 2009

Soil and waste cleanup activities completed in 2009 included excavation of the remaining soil contamination in the south portion of the site, completion of the excavation in the PCP process area, excavation of the 22nd Street lagoon, and excavation of the Jennite pit. The majority of the 22nd Street lagoon required excavation to the groundwater table to a depth of approximately 18 feet bgs, while the majority of the Jennite® pit was excavated below the groundwater table to a depth of 25 feet bgs. The excavated soil, which was classified as listed hazardous waste F032 (related to wood preserving processes), was shipped to Recupere Sol, Inc. located in St. Ambroise, Quebec, Canada for incineration. EEI was again asked to provide construction monitoring during field activities.

- A total of 76,005 tons of cPAH-contaminated soil was transported for disposal to Milam Landfill, East St. Louis, Madison County, Illinois;
- A total of 6,907 tons of drip track residue and dioxin-contaminated soil was transported for off-site thermal incineration to one of three Clean Harbors, inc. locations: 1,796 tons were sent to Argonite, Utah; 3016 tons were sent to Laporte, Texas; and 2095 tons were sent to Kimball, Nebraska.
- A total of 254 tons of railroad ties was transported for disposal to Milam Landfill, East St. Louis, Madison County, Illinois.
- 87,459 tons of backfill were brought to site for the south parcel from Barbier Hill, Belleville, Illinois.

Other activities completed during 2009 included additional injections of HRC® into the subsurface of the PCP process area; excavation of contaminated soil from beneath 22nd Street; and the construction of the OU2 facility at the 22nd Street lagoon.

The 2009 HRC® injections were designed to remediate the groundwater contamination remaining within the PCP process area because positive results had been observed in previous injection investigations. Unlike previous injection rounds, this round of injections consisted of 3-D microemulsion (3DMe)™ HRC® concentrate manufactured by Regenesys and was designed to span the estimated vertical and horizontal extent of contaminated groundwater plume that was

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observed during the 2008 sampling event. 3DMe™ HRC® concentrate is specifically designed to maximize the anaerobic treatment of contaminants in subsurface soils and groundwater; 7,350 pounds of 3-D microemulsion (3DMe)™ HRC® concentrate was injected in the PCP process area in 2009.

BESI subcontracted Environmental Field Services (EFS), located in Westfield, Indiana, to perform the injections using the pressure injection methods recommended by Regenesys. The injection interval for the treatment zones was 18 to 33 feet bgs. EFS conducted injections from July 13, 2009 through July 21, 2009.

The OU2 remedy was implemented to mobilize the NAPL plume observed in the area system consists of six hot water injection wells and two groundwater/NAPL extraction wells. The six injection wells were placed along the NAPL plume boundary and the two extraction wells were centered within the injection well locations based on capture calculations performed by EEEL. The extraction wells pump contaminated groundwater mixed with NAPL to an on-site hot water generation and treatment building. The building that houses hot water generation and groundwater treatment equipment and controls was assembled by the CAC's subcontractor, Plocher Construction, Inc. (Plocher). Plocher utilized AMSCO Mechanical for installation of system piping, including the hot water generation system, Pyramid Electric for installation of the building electric, and George Ackley and Sons for the controls system installation and programming. The two extraction wells (EW-1 and EW-2) and the hot water injection wells (HWI-1 through HWI-6) were constructed by the CAC's subcontractor Layne Christensen Drilling, Inc.

Force mains carry extracted groundwater at a flow rate of 50 gallons per minute (gpm) to the treatment building. Extracted groundwater enters the NAPL phase separator where light nonaqueous phase liquids (LNAPLs), dense nonaqueous phase liquids (DNAPLs), and the remaining groundwater are separated by specific gravity. Separated NAPL is stored for later disposal. Groundwater then gravity- drains from the NAPL phase separator to the influent tank.

From the influent tank the groundwater is processed through the groundwater treatment system. The treatment technologies selected for Jennison-Wright include both clay adsorption filtration and granular activated carbon (GAC) adsorption systems for the removal of arsenic, SVOCs, and volatile organic compounds (VOCs). Bag filters placed before the carbon vessel protect the treatment components from oil remaining in the groundwater. Following treatment, the groundwater is then transferred to the hot water generation system at a flow rate of 40 gpm to be heated and re-injected into the aquifer. A portion of the groundwater is simultaneously discharged at a flow rate of 10 gpm to the Granite City Regional WWTP.

The hot water generation system includes a boiler, heat exchanger, condenser, and hot water system feed pump. Water is heated and pumped to the aquifer at a temperature of approximately 150°F. The temperature setting is adjustable and

can be increased to as high as 190°F. The main components of the hot water generation system are housed in a separate room of the groundwater treatment building and isolated from the groundwater treatment process equipment.

Once the OU2 facility was constructed, the startup/shakedown period was initiated. Startup/shakedown activities took place from September 30, 2009 to September 30, 2010. Record drawings of the facility showing process equipment are included as Appendix A.

Shakedown Activities and System Modifications (October 2009 through December 2010)

In 2009, the groundwater treatment system was installed to extract NAPL and treat impacted groundwater from the former 22nd Street Lagoon area. The USEPA determined the groundwater treatment system to be substantially completed in accordance with the remedial design plans and specifications in September 2009. The groundwater treatment system was started and due to issues with scaling of the heat exchanger, the system was redesigned by EEI in December of 2009. EEI added a feed tank and changed the piping so the groundwater from the extraction wells would be treated prior to entering the heat exchanger. The groundwater treatment system continued to experience iron and calcium carbonate scaling issues, so the temperature to the injection wells was lowered to 140 degrees Fahrenheit and antiscalent chemical was utilized to improve operating time. The groundwater treatment system was determined to be Operational and Functional by the USEPA and Illinois EPA in September of 2010.

During the operation period from October 1, 2010 to December 31, 2010, the groundwater treatment system operated 84 days. The groundwater treatment system was shut down to perform cleaning activities and install additional treatment equipment. System maintenance activities and modifications during the shakedown consisted of the following:

- Cleaning of the heat exchanger and feed tank with a descaling acid;
- Completed construction of road adjacent to the injection and extraction wells, and installation of drainage culverts to divert storm water to the retention pond;
- Removed mechanical flow meters from extraction wells due to corrosion and causing low flow alarms;
- The inflatable packer in Injection Well #4 was losing air pressure, so the stainless steel fittings were tightened and the packer was re-inflated;
- Installed new bag filter housings before the organoclay treatment tank and the activated carbon treatment tank;
- Installed PVC piping from feed tank to the heat exchanger to simplify cleaning of the heat exchanger with the descaling acid;
- Plocher Construction installed walls to enclose the boiler and generator;
- Replaced the Low-Low float in the feed tank; and
- Replaced the belt in the vapor phase blower fan.

Areas of the Site with Remaining Contamination

There are several areas at the site where engineering controls were unable to achieve or have yet to achieve the cleanup objectives (CUOs) or where the controls could not be implemented due to physical site restrictions (i.e., utilities, proximity to the railroad, etc.). These areas are described below.

Groundwater Contaminant Areas Exceeding CUOs

Four site areas have been identified as requiring institutional controls (ICs) based on current levels of contamination. These areas can be modified in the future by the EPA and/or the Illinois EPA to address changes in site conditions and concentrations.

22nd Street Lagoon: The area near the 22nd Street Lagoon has groundwater impacted with NAPL from the surface of the groundwater table to bedrock, which is located approximately 115 feet below ground surface (bgs). The highest levels of contamination in groundwater were observed at depths of approximately 30 feet bgs within the 22nd Street Lagoon. Although the source of this contamination has been excavated and sent to an appropriately licensed incinerator for disposal, and an extraction system is in place to collect NAPL and mitigate the migration of dissolved-phase contaminants, it is unlikely that groundwater in this area will meet the CUOs in the short term. NAPL extraction will be ongoing until the plume appears to meet isotropic conditions, at which time a dissolved-phase remedy will be designed and implemented to address remaining groundwater contamination. ICs will be established to prohibit groundwater use and activities that would interfere with ongoing remedial activities as well as prevent potential exposure to existing groundwater contamination.

PCP Process Area: The second area that will be managed through ICs includes the contamination identified in the vicinity of the former PCP Process Area. This area includes the adjacent alley and adjoining properties located beyond the western property boundary. ICs in this area will require both on-site and off-site management, given the extent of the current contaminant plume. Surface soils have been excavated and three rounds of HRC[®] injections were performed to address groundwater contamination within this area; however, concentrations of select SVOCs in groundwater still exceed their CUOs. Until engineering controls have mitigated the groundwater plume within the PCP Process Area, ICs will be implemented to minimize future contaminant exposure.

Area H: The third area to be managed through groundwater ICs is Area H. Much of the surface soil contamination within this area has been excavated and disposed of off site; however, a layer of NAPL is evident at approximately 12 feet bgs, and further excavation of this area is inhibited because of the presence of an active railroad line. Although the levels of groundwater contamination in this area were observed to be lower than those that remain in the areas identified above, the NAPL is a continuing source of groundwater contamination. Engineered control systems were not selected in the ROD to remediate the groundwa-

ter within Area H, and ICs will be implemented to minimize future exposure to contamination in this area.

Jennite Pit: The concentrations of impacted groundwater within the Jennite Pit are significantly lower than those detected in the PCP Process Area and the 22nd Street Lagoon. Much of the surface and subsurface soil contamination within this area has been excavated down to the groundwater table and removed from the site; however, recent investigations determined that a thin NAPL layer remains at approximately 25 feet bgs. Groundwater contamination above CUOs within the Jennite Pit has been observed to extend to approximately 30 feet bgs. The NAPL layer is a continuing source of groundwater contamination. ICs will be implemented to minimize future exposure to contamination until engineering controls can be implemented.

Soil Contaminant Areas Exceeding CUOs

There are three areas at the site where remaining soil contaminant concentrations exceed the CUOs after implementation of the selected remedy. These areas are described below.

Railroad Crossing at 22nd Street: This area is just northeast of the 22nd Street Lagoon, along 22nd Street. Most surface soil adjacent to this area has been excavated; however, due to the proximity of the active railroad line and subgrade utilities that are present in this area, contaminated soil could not be removed during implementation of the remedial action. Soil that exceeds the CUOs remains on site in this area.

Area H: Area H, located beyond the northeast corner of the site, contains high levels of subsurface soil contamination. Most of this area was excavated to approximately 12 feet bgs based on the visual presence of contamination in the soil. The excavation was terminated at the groundwater interface and backfilled with clean fill material. Based on observations made during excavation activities, soil contamination is believed to remain on the east and west sidewalls of the excavation. The removal of the remaining contaminated soil was determined to be unfeasible due to concerns about excavation in the vicinity of the active railroad line to the east and the Illinois American Water Company to the west. This area will be managed through ICs.

Eastern Property Boundary Along Railroad Easements: The contamination within the area between the railroad easement located east of the site and the property boundary has not been mitigated through engineering controls since this area is located off site and access was not granted to perform mitigation. In order to prevent disturbance of contaminated soil within this area, ICs will be implemented under this ICIP along the entire extent of the eastern property boundary to prevent exposure to subgrade contamination.

Preliminary Close-out Report Inspection

Construction completion occurs when the construction work at a site's last operable unit has been completed. A "construction completion" site is an NPL site where physical construction of cleanup activities is complete, immediate threats have been addressed, and long-term threats are under control even though final cleanup goals may not have been achieved. By contrast, "site completion" signifies the end of response actions. Site completion means that cleanup goals have been achieved and no further Superfund response is required to protect human health and the environment. A PCOR is prepared by the EPA, in this case with assistance from the Illinois EPA as the lead agency for the site, to demonstrate that construction completion has occurred in accordance with *Close Out Procedures for National Priorities List Sites* (2000).

The pre-final inspection was conducted by EPA, Illinois EPA, and Illinois EPA's contractors, EEEI and BESI, on September 16, 2009. The inspection consisted of a walk-through of the site, inspection of the extraction and hot water injection wells, and inspection of the treatment plant. The pre-final inspection showed that the construction was substantially completed and was carried out according to the remedial design plans and specifications.

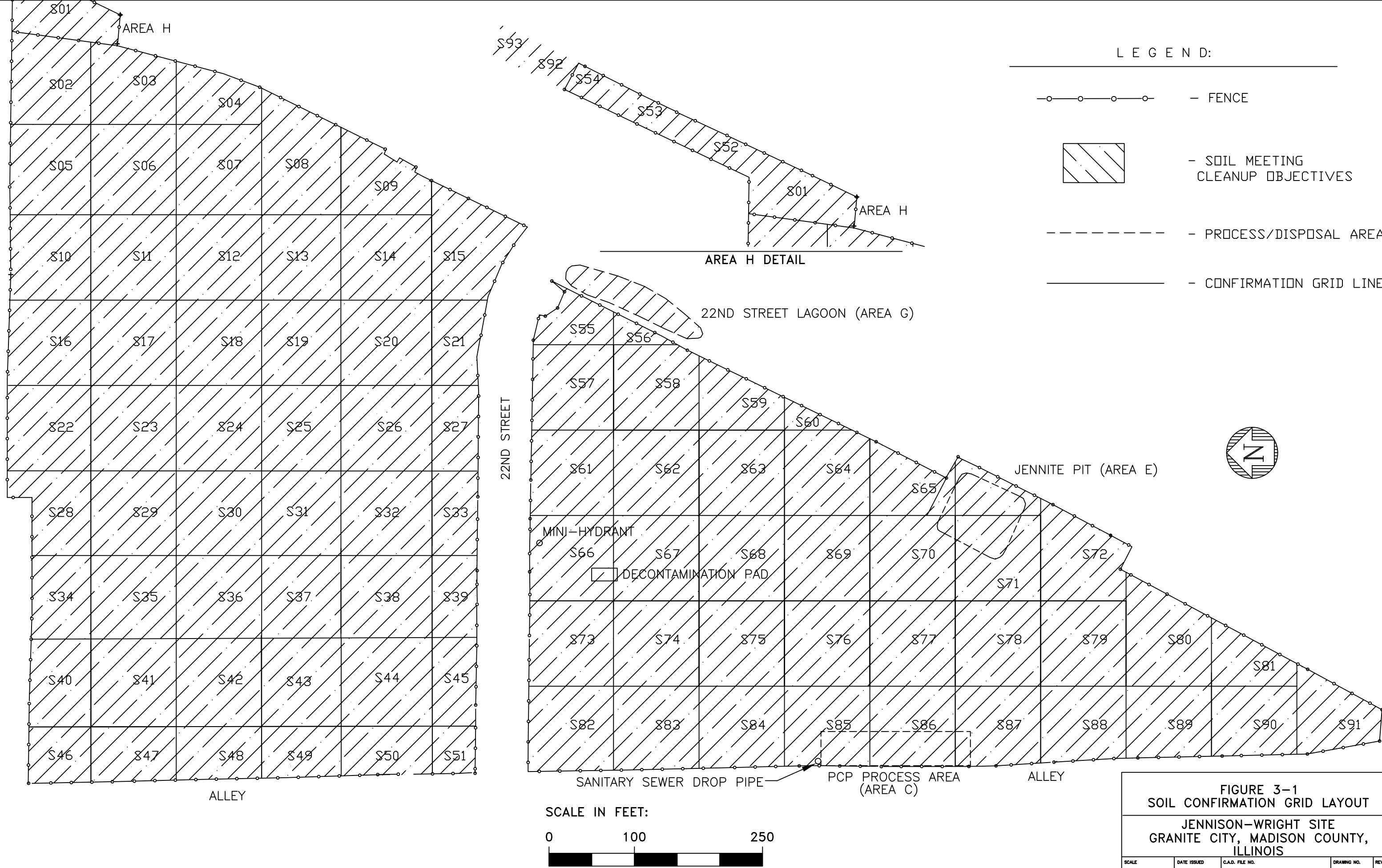
Both the EPA and the Illinois EPA reviewed the remedial action for compliance with QA/QC protocols. Confirmatory inspections, independent testing, audits, health and safety protocols, and evaluations of materials and workmanship were performed in accordance with the remedial design/remedial action plans and specifications. Construction quality assurance was provided by BESI. The Illinois EPA Manager and the EPA Remedial Project Manager routinely visited the site to review progress of the remedy. Deviations from the plans and specifications were properly documented.

Environmental sampling was conducted in accordance with the approved QAPP, design plans, and specifications that specified appropriate sampling and analytical techniques. The EPA and Illinois EPA have determined that analytical data are accurate to the degree necessary to ensure satisfactory execution of the RA.

The EPA and Illinois EPA will continue to monitor site activities necessary to achieve site completion and deletion from the NPL.

Table 3-1 Final Remedial Action Project Chronological Data Jennison-Wright Corporation Site, Granite City, Illinois

Event	Date
Wood-treating activities at the site	1921 - 1989
Illinois EPA initiates a stabilization effort at the site to alleviate the spread of contamination.	1992
Interim removal activities - removing drums, liquids and sludge from tanks	1994
Final listing on EPA National Priorities List (NPL)	6/1996
Engineering Evaluation/Cost Analysis (EE/CA) and proposed plan identifying Illinois EPA's preferred remedy presented to public; start of public comment period.	1999
ROD selecting the remedy is signed	9/29/1999
Limited Remedial Action - Start of OU4 and OU5 activities (building/structures demolition and decontamination. 1st phase of site Remedial Action and date that triggers a five-year review)	3/2003
Remedial Design (RD) for the site is completed	7/21/2003
End of Limited Remedial Action - Completion of OU4 and OU5 activities (building/structures demolition and decontamination)	11/2003
Long-Term Remedial Action focusing on OU1 north side soils is initiated	4/2005
Explanation of Significant Differences (ESD) signed – Contaminated soils are shipped to off-site landfill instead of being treated in an onsite landfarm.	10/2005
Long-Term Remedial Action focusing on OU1 north side soils is completed	10/2005
Long-Term Remedial Action focusing on OU1 south side soils is initiated	8/2007
Second Explanation of Significant Differences (ESD) signed – modified the remedy to include institutional controls, the use of a different substrate to enhance in situ groundwater bioremediation, excavation of soils beneath 22nd Street, extraction and off-site disposal of NAPL from the Jennite® pit, and identification of a contingency remedy for potential additional NAPL and groundwater contamination in the Jennite® pit area.	6/2009
First 5-year review is completed	6/2009
Long-Term Remedial Action focusing on OU1 south side soils is completed	5/2009
Preliminary Close-Out Report (PCOR) is signed	9/28/2009
Determination of Operational and Functional (O&F) status	9/29/2010
Implementation of Institutional Controls	Ongoing
Long-Term Remedial Action focusing on south side OU2 NAPL plume and OU3 groundwater is completed.	Ongoing



4

Performance Standards and Construction Quality Assurance

4.1 Construction Quality Assurance

Under contract to the Illinois EPA, EEEI provided oversight of BESI construction activities and found them to be consistent with the ROD, as modified by the subsequent ESDs, as well as with the remedial design plans and specifications.

BESI completed a Construction Operations Plan in May 2003 that incorporated EPA and Illinois EPA requirements. Confirmatory inspections, independent testing, audits, and evaluations of materials and workmanship were performed in accordance with the construction drawings, technical specifications, and the construction operations plan. Construction quality assurance was performed by Illinois EPA's contractor, EEEI, which maintained a presence throughout the construction activities. On-site EEEI personnel included engineers as well as individuals experienced in overseeing environmental remedy construction. Substantive requirements (such as physical testing) were required during remedial action and were successfully achieved. Known deviations or non-adherence to quality assurance/quality control (QA/QC) protocols, drawings, or specifications were documented and resolved.

The remedial action followed applicable federal and state environmental and safety statutes, regulations, and policies. EEEI was present and documented the construction activities associated with the remedy. The following subsections document the QA/QC requirements that were met during construction activities.

4.1.1 Well Construction and Boring Permits

Monitoring, extraction, and hot water injection wells were designed, installed, and developed in accordance with requirements of the EPA, the State of Illinois, and approved plans and specifications. Wells were installed by a State of Illinois licensed well driller.

4.1.2 UST Removal Permit

In 2003, BESI attained permit # 02436-2003REM from the Office of the Illinois State Fire Marshal that allowed the third-party removal, by BESI, of two 500-gallon USTs from the Jennison-Wright site. The USTs were removed in accordance with applicable federal, state, and local regulations and laws.

4.1.3 Asbestos Monitoring

In 2003, the buildings on the site were inspected for asbestos. Samples were collected and sent to United Analytical Services in Downers Grove, Illinois. Removal of ACM was performed by Triple A Asbestos Services, located in Pana, Illinois. ACM removal and monitoring was in accordance with applicable federal, state, and local regulations and laws. Proper procedures for air monitoring, containment construction and maintenance, high-efficiency particulate air (HEPA) negative air pressure, HEPA vacuums, proper wet procedures, decontamination procedures, respirator procedures, bagging, labeling, scaling, encapsulation, cleanup, and waste disposal to an authorized landfill were followed.

4.1.4 Waste Manifests and Bills of Lading

During remedial activities, BESI kept records of wastes that were disposed of off-site. These waste manifests and bills of lading were compiled by BESI and submitted to the Illinois EPA as part of the Limited Remedial Action Site Summary volumes. Records of waste shipments since 2006 are maintained by BESI at their headquarters.

4.1.5 Backfill Source Investigations

Prior to backfill operations, BESI tested borrow material for polychlorinated biphenyls (PCBs), VOCs, SVOCs, and metals concentrations greater than TACO Tier 1 residential standards. BESI submitted the borrow material samples and the testing results to the Illinois EPA, and the source of borrow material was made available for inspection by the Illinois EPA. EEEI accompanied BESI when inspecting the borrow source areas.

4.1.6 Confirmation Soil Sampling

Throughout soil removal activities, confirmatory soil sampling was performed to determine if CUOs were being achieved. Soil samples were submitted to Test America for SVOC and PCP analysis. The CUOs established in the ROD were compared with the soil sample results. Analytical data are summarized in Table 4-1. Any analytical sample result that exceeded a CUO is highlighted in the table.

In general, soil contaminant concentrations across the site currently meet the soil CUOs established for the site. Soil contaminant concentrations exceeded CUOs at the 22nd Street Lagoon, Jennite® pit, and PCP process area down to groundwater. The on-site soils were removed and the remaining cleanup will target NAPL and groundwater in these areas. In Area H, excavation of contaminated soils exceeding CUOs was hindered by the proximity to adjacent railroad lines, a water main, and electric poles. To address the remaining contaminated subsurface soils in Area H, a HDPE liner was placed above the contaminated soils to prevent surface water infiltration. Riprap was placed above the liner for protection and to aid in drainage.

4 Performance Standards and Construction Quality Assurance

4.1.7 Building and Construction Permits

BESI attained permit number 09-1753 X BEMPSWSX from the City of Granite City for the construction of the OU2 facility. Inspections were performed by the City of Granite City for the excavation and plumbing, sewer, electrical, and mechanical systems and the structure associated with the OU2 facility. Inspections were passed upon the first inspection except for the building roof, which required additional seals to prevent rainwater infiltration. Following final inspection, the OU2 facility was found to be in compliance with applicable building and construction requirements.

4.1.8 Soil Compaction and Concrete Batch Testing

Soil compaction and concrete batch testing for the OU2 facility foundation was performed by Quality Testing and Engineering, Inc. located in O'Fallon, Illinois. Soil compaction and concrete batch test results indicated that proper soil compaction was achieved and concrete batch requirements were met.

4.1.9 Granite City Discharge Permit

The Jennison-Wright groundwater treatment system discharges into the Granite City regional WWTP, which ultimately discharges into the Mississippi River through the Chain of Rocks Canal and is identified as a natural water of the state. The WWTP maintains a NPDES permit for their collection and treatment system while providing final treatment and the ultimate discharge location of any effluent from the Jennison-Wright site; therefore, the OU2 facility is required to have a Granite City regional WWTP discharge permit. The WWTP permit number IWDP-360 became effective on January 15, 2010 and will expire on January 15, 2015. A copy of this WWTP permit is included as an appendix to this document.

The treatment plant must operate in a manner that meets the requirements of the discharge permit. The permit establishes discharge load limits in pounds per day and concentration limits in mg/L. The WWTP permit requirements calls for semimonthly grab sampling and weekly flow readings weekly. The discharge permit and its requirements are included in the site's O&M Plan and O&M Manual. Operational samples are collected to monitor the effectiveness of the treatment process and to determine if breakthrough from system components is occurring. Samples of the combined groundwater influent (EW01 and EW02) and the treated effluent are collected in order to evaluate the removal efficiency of the NAPL separation, clay adsorption, and GAC units. The types and frequency of operational samples are documented in the site's O&M Manual.

BESI has a QAPP that incorporates U.S.EPA and Illinois EPA procedures and protocols for sample collection, handling, and analysis. EPA analytical methods are used for confirmation and monitoring samples. Illinois EPA and its O&M contractor, BESI, in consultation with the EPA, determined that the analytical results are accurate to the degree needed to assure satisfactory execution of the remedial action.

4.2 Construction Modifications

EEEI oversight personnel ensured that project plans and specifications were followed throughout the remedial action. If changes were warranted, then they were documented through the procedures set out in the Construction Operations Plan and remedial design specifications. Some of the modifications documented included specifications and drawings.

Any specification changes were documented in correspondence between EEEI and BESI and filed in the site electronic file system. The documentation of these changes was verified by the sealing engineer before changes were implemented.

Drawing changes were also documented and filed in the same manner as the specification changes. These and other drawing changes are documented in the Record Drawings provided in Appendix A.

5

Groundwater Monitoring

Groundwater monitoring was conducted at the Jennison-Wright site in 2003, 2005, 2007, 2008, 2009, and 2010. Samples were collected and analyzed for SVOCs, PCP, and VOCs. Figure 5-1 shows monitoring well sample locations. Following sampling events the CUOs established in the ROD were compared with the groundwater sample results. Table 5-1 contains the sampling results from the most recent sampling round at each monitoring well location.

Analysis of groundwater sample results indicates that groundwater contamination is below site CUOs in the majority of the site. Groundwater contamination remains above site CUOs in Area H (MW2S), the 22nd Street lagoon area (MW5S, MW20, MW21, MW22, and MW23), former UST location (MW16S), the PCP process area (MW8S and MW8D) and the suspected location of a former sump or discharge line (MW6S). Figure 5-2 shows the PCP groundwater plume areas in 1997, and Figure 5-3 shows the PCP groundwater plume areas in 2009.

In the last groundwater sampling event in October 2010, the maximum concentration of PCP (86,000µg/L) was detected at MW8S. The maximum concentration of naphthalene (36,000µg/L) was detected at MW5S. The maximum concentration of 2,4-dimethylphenol (13,000µg/L) and 2-methylphenol (2,700 µg/L) was also detected at MW5S. MW5S and MW5D are located in the 22nd Street lagoon area, while MW8S is located in the PCP process area. MW5D has not had a recent sample due to DNAPL covering approximately 8 feet of the 10-foot screen interval. There is also a combination of LNAPL, DNAPL, or both present in the other wells located in the area of the 22nd Street lagoon (MW5S, MW21, MW22, and MW23).

NAPL and groundwater remediation is ongoing, although construction completion has been achieved.

Table 5-1 Groundwater Data Summary Table

Sample Location	Last Sampling Round	Pentachlorophenol	Naphthalene	Benzene	2,4-Dimethylphenol	2-Methylphenol
		1	400	10	200	500
CUO	Year	1	400	10	200	500
MW1S	2007	ND	ND	NS	ND	ND
MW2S	2008	1.4	0.21 J	NS	ND	ND
MW3S	2007	ND	ND	NS	ND	ND
MW4S	2007	ND	ND	NS	ND	ND
MW5S	2010	1300	35000	NS	13000	2700
MW5D	2010	NS	NS	NS	NS	NS
MW6S	2007	3.2	0.37	ND	ND	ND
MW6M	2008	ND	0.48 J	ND	ND	ND
MW6D	2008	0.18	0.59 J	ND	ND	ND
MW8S	2010	86000	110	NS	ND	ND
MW8M	2010	12	67	NS	ND	ND
MW8D	2010	ND	11	NS	ND	0.64 J
MW9S	2007	ND	ND	NS	ND	ND
MW10S	2007	0.2	ND	NS	ND	ND
MW11S	2007	ND	ND	NS	ND	ND
MW12S	2007	ND	ND	NS	ND	ND
MW13S	2007	ND	ND	NS	ND	ND
MW14S	2007	ND	ND	NS	ND	ND
MW15S	2007	ND	ND	NS	ND	ND
MW16S	2008	ND	72	10000	5.7 J	8.1
MW17S	2008	ND	0.35 J	NS	ND	ND
MW18S	2010	0.1 J	ND	NS	ND	ND
MW19S	2007	0.14	ND	NS	ND	ND
MW20	2010	0.17 J	23	NS	2.3 J	0.77 J
MW21	2009	22000	7900	NS	190	97
MW22	2010	1200	17000	NS	9000	2000
MW23	2010	1900	29000	NS	3800	1600

Note: Analytical results are in micrograms per Liter (ug/L).

Key:

ug/L = Micrograms per Liter.

J = Detection was greater than the method detection limit but below the method quantification limit.

ND = Not detected above analytical method detection limit.

NS = No sample was collected for the parameter within the last 5 years.

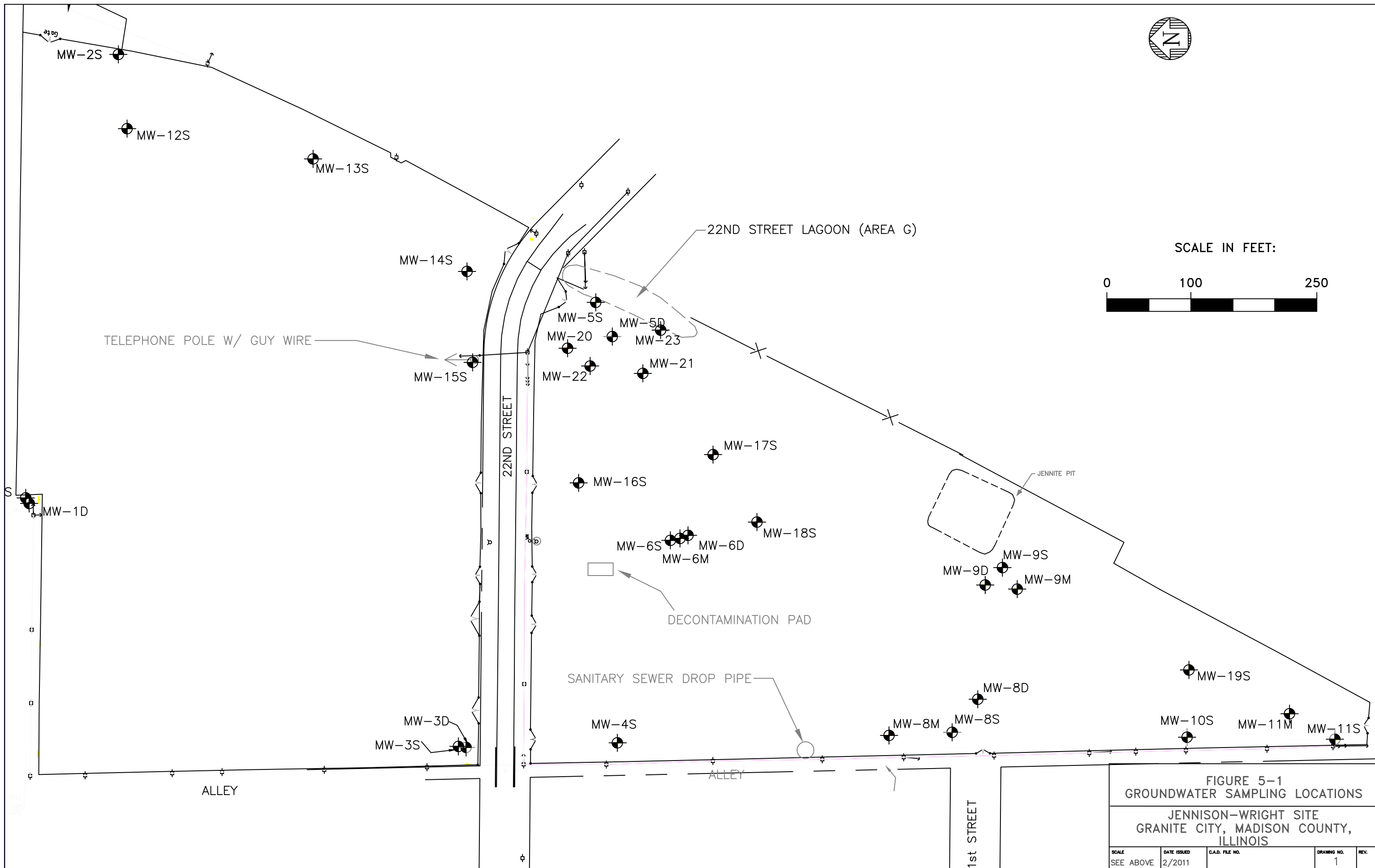


FIGURE 5-1
GROUNDWATER SAMPLING LOCATIONS
JENNISON-WRIGHT SITE
GRANITE CITY, MADISON COUNTY,
ILLINOIS

SCALE	DATE ISSUED	C.A.D. FILE NO.	DRAWING NO.	REV.
SEE ABOVE	2/2011		1	

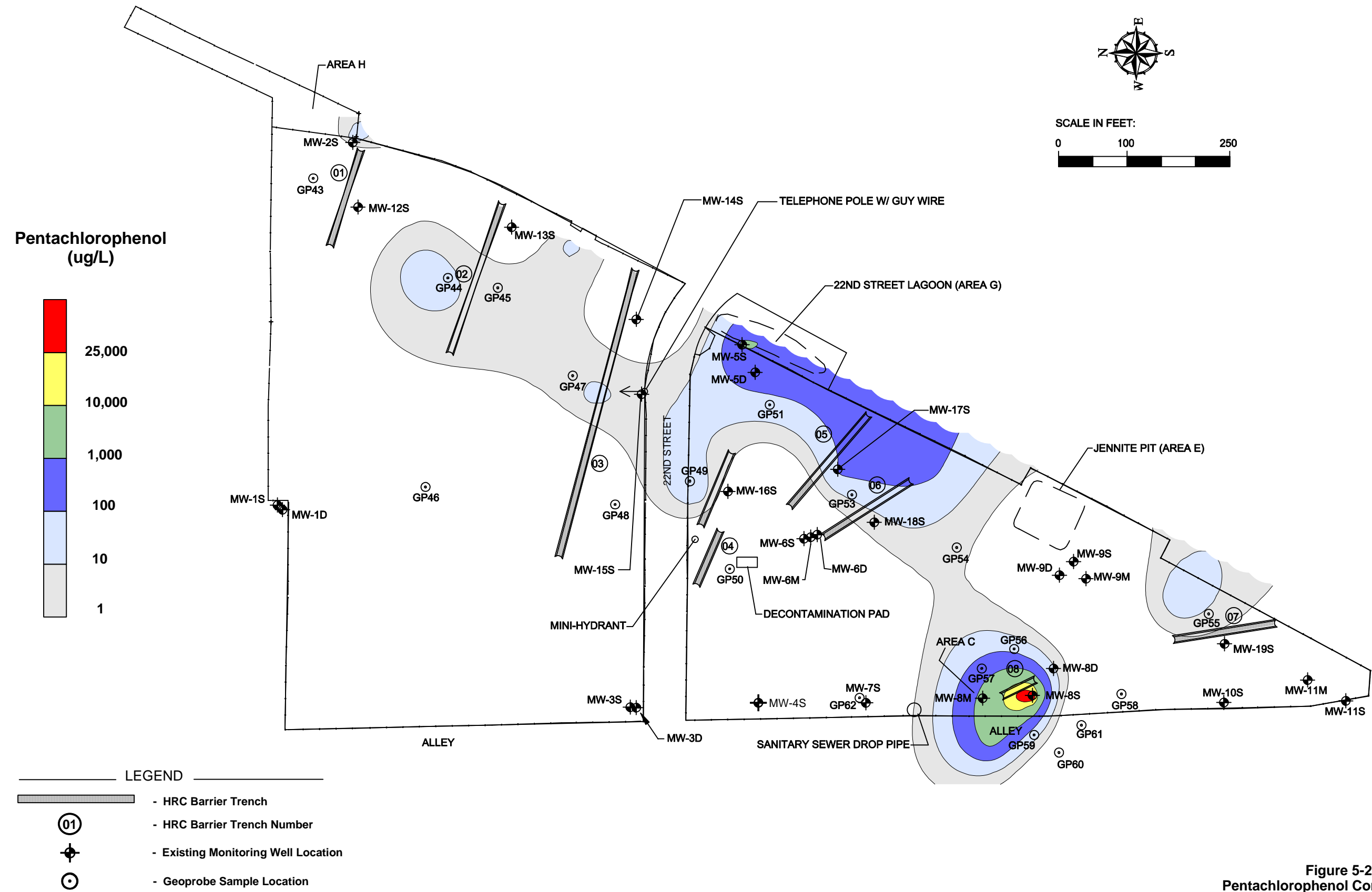
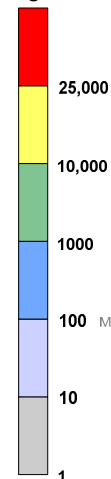


Figure 5-2
Pentachlorophenol Concentrations
in Groundwater, 1997
Jennison-Wright Site, Granite City, Illinois

PCP
ug/L

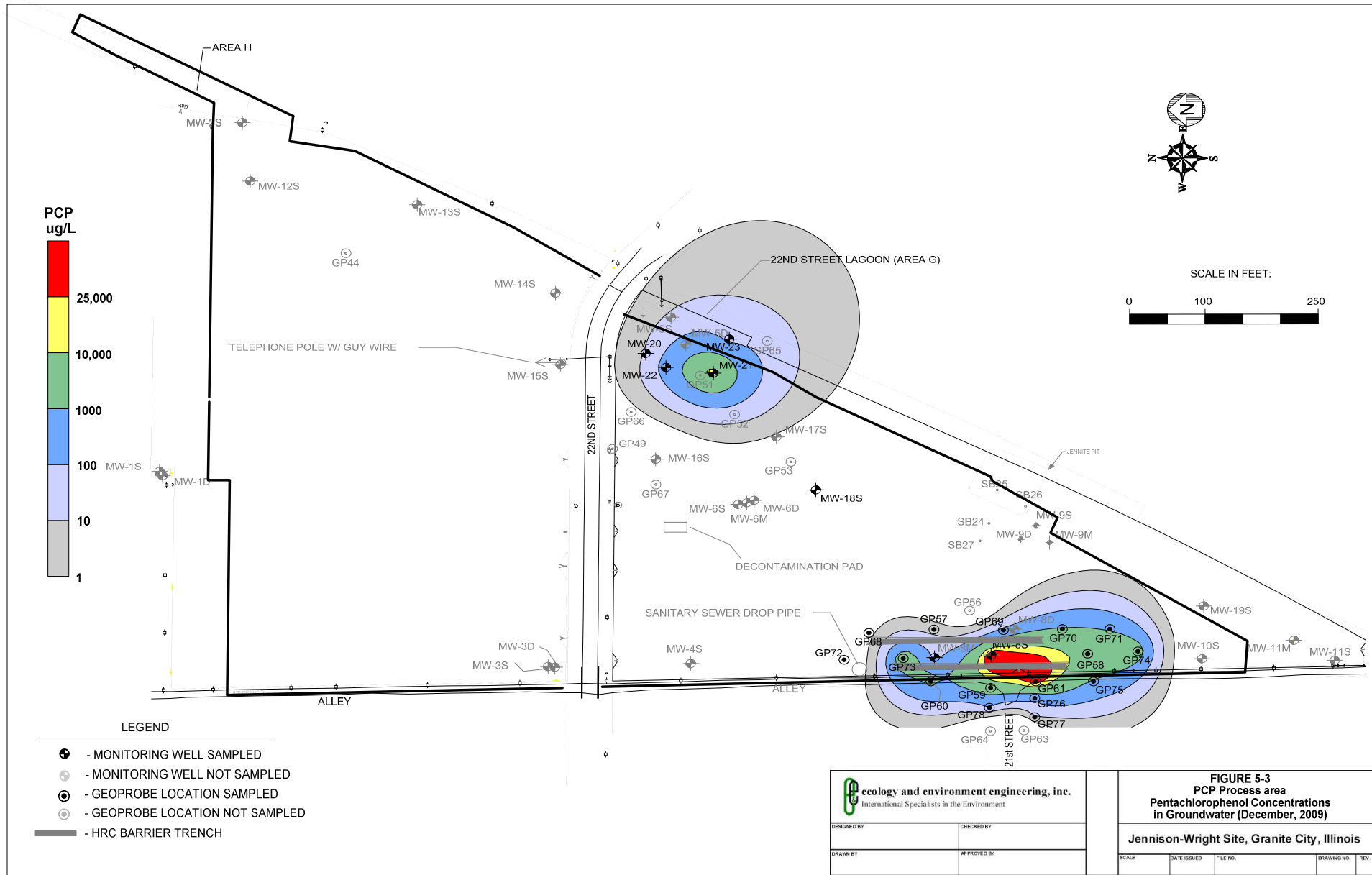
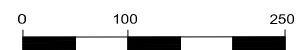



LEGEND

- ⊕ - MONITORING WELL SAMPLED
- ⊙ - MONITORING WELL NOT SAMPLED
- ⊙ - GEOPROBE LOCATION SAMPLED
- ⊙ - GEOPROBE LOCATION NOT SAMPLED
- - HRC BARRIER TRENCH



SCALE IN FEET:



 ecology and environment engineering, inc. International Specialists in the Environment		FIGURE 5-3 PCP Process area Pentachlorophenol Concentrations in Groundwater (December, 2009) Jennison-Wright Site, Granite City, Illinois			
DESIGNED BY	CHECKED BY	SCALE	DATE ISSUED	FILE NO.	DRAWING NO.
DRAWN BY	APPROVED BY				REV.

6

Operation and Maintenance Activities

EEEI prepared two operation and maintenance (O&M) documents—the O&M Plan and O&M Manual—for the Jennison-Wright site (Ecology and Environment Engineering, Inc. 2009).

The O&M Plan covers implementation and long-term maintenance of the remedial action for the Jennison-Wright Corporation facility, as defined in the ROD for the site (Illinois EPA 1999). The document details the administrative requirements for inspecting, operating, and maintaining the remedial action, including information on maintaining, as appropriate, institutional controls.

The O&M Manual incorporates pertinent operational requirements of the NAPL recovery and groundwater treatment system and requirements for long-term groundwater monitoring, influent and effluent sampling, and performance tracking (e.g., mass balance calculations of water discharges). The O&M Manual provides a comprehensive description of the treatment system and major process units installed at the site, based on information collected from historic drawings and documents, engineering evaluations conducted during the remedial design, and record drawings documenting the completion of the recent remedial action. The O&M Manual provides the tools to effectively operate, monitor, and maintain this system in accordance with federal, state, and local regulations and to ensure that the remedy remains protective of human health and the environment.

Under its current O&M duties, BESI remains responsible for O&M of components of the final remedy, long-term groundwater monitoring, and system monitoring and reporting for the Granite City Regional WWTP permit compliance.

Sampling of the treatment system and site monitoring wells is conducted in accordance with the EPA-approved Quality Assurance Program Plan (QAPP) for the site (Bodine Environmental Services, Inc. May 2010). A copy of the approved QAPP is maintained with the O&M Manual at the NAPL recovery and groundwater treatment plant. The groundwater monitoring plan for the remedial action also consists of sampling selected monitoring wells on the site.

Granite City Regional WWTP permit number IWDP-360 allows the site to discharge treated water into the WWTP. This permit was issued on January 7, 2010 and expires on January 15, 2015. The WWTP maintains a National Pollu-

tant Discharge Elimination System (NPDES) permit for their collection and treatment system while providing final treatment and the ultimate discharge location of any effluent from the Jennison-Wright site. The NAPL recovery and groundwater treatment plant must operate in a manner that meets the requirements of the discharge permit. Permit-required effluent samples are collected after the GAC unit and prior to being discharged. The permit establishes discharge load limits in pounds per day and concentration limits in milligrams per liter (mg/L).

The pH is recorded each time an effluent sample is collected, and the monthly minimum and monthly maximum values are reported as required by the permit.

The average flow rate from each extraction well is calculated by recording the total gallons pumped over a specified time period. The total gallons pumped from each extraction well are tracked using individual flow totalizers installed on each influent line. Total system flow is monitored by a totalizing flow meter installed on the discharge line.

Monitoring of the on-property groundwater plume through existing and new monitoring wells for SVOCs is part of the on-property groundwater plume source treatment and control measures. This monitoring quantifies the progress of the treatment and control measures employed and continues the current sampling and analysis program for the existing groundwater monitoring wells. To reestablish a baseline for the extended extraction system, existing monitoring wells were sampled for SVOCs and monitored for water levels immediately preceding startup of the new extraction wells. Subsets of these wells are monitored annually or quarterly thereafter, in accordance with the schedule provided in the site O&M Plan and as an appendix to this document. A reduction or increase in the monitoring locations or frequency, or abandonment of certain wells, may be proposed in the future, after an annual review of monitoring data.

BESI is in charge of day-to-day operation of the treatment system. Operational checks, system sampling and analysis, and data collection are performed by BESI personnel. BESI uses the QAPP to guide its quarterly site-wide groundwater and monthly NPDES sampling as part of their continuing O&M activities at the site. Information gathered from the sampling is used to determine conformance to remedial action goals and progress toward attainment of cleanup objectives. Other primary O&M activities that BESI is responsible for include semi-annual site mowing, inspection of the condition of the perimeter fence, inspection of the drainage swale for blockage, erosion and instability, and inspection of the condition of groundwater monitoring wells.

7

Cost and Performance Summary

BESI was contracted by the Illinois EPA to perform the remedial actions at the Jennison-Wright site from 2003 through 2005 and 2007 through 2010. BESI held contracts with the companies that provided equipment, tradesmen, and supplies for the work. Table 7-1 contains a cost breakdown for the various tasks that made up the work, and Table 7-2 contains estimated costs that were presented in the Record of Decision (U.S. Environmental Protection Agency 1999). The ROD estimated cost was \$10,510,000; the complete cost for actual construction totaled \$17,900,749. The following descriptions of OU costs have been assembled using historic invoicing. Some of the OUs were remediated concurrently so it would be difficult to separate the cost. Costs for work such as HRC® injections that occurred in 2003 and 2005 and PCP process area excavations that occurred during the groundwater treatment system construction could not be easily separated because the same operator did the grading, utility excavations, and contaminated soil excavation and sometimes used the same equipment. Where costs could be separated they were. Overall the costs give an order of magnitude that indicates how the construction and remediation cost differed from costs presented in the ROD.

OU1: Soils and Wastes (Construction Complete)

The ROD had specified landfarming as the remedy for soils and off-site disposal as the waste remedy. Because it was determined that surface soil contamination extended deeper than had been anticipated and that soil concentrations of benzo(a)pyrene (BaP) greatly exceeded the treatment criteria for landfarming, the remedy for soils was changed to off-site disposal. The final cost for OU1 remediation was \$14,224,266. It was estimated in the ROD that the cost for remediating soils and wastes would be \$3,643,000. The difference in the estimated and final costs can be attributed to contamination extending deeper than anticipated and to a greater percentage of this contamination being waste. The north parcel had an average depth of excavation of 2.3 feet bgs while the ROD had presented a volume equal to 1 foot of excavation across the site. Many of the excavations on the south parcel extended to groundwater at 15 to 18 feet bgs below tram lines. The ROD estimated 55,000 cubic yards of soil and 300 cubic yards of waste to be removed from site. The actual totals were 134,000 cubic yards of soil and 10,000 cubic yards of waste.

This cost for OU1 also includes additional work completed to remove contamination below 22nd Street and to extend excavations further into Area H. These activities came from ESD2 and were not budgeted for in the ROD.

OU2 and OU3: NAPL and Groundwater (Construction Complete with Ongoing O&M)

The costs for OU2 and OU3 activities could not be easily segregated from each other. The final cost for construction of the OU2 facility, HRC® injections and additional excavation work in the PCP process area was \$2,587,202. It was estimated in the ROD that the cost for these activities would be \$5,926,000. Although construction completion has been achieved, ongoing O&M means the cost is not final. Current O&M expenditures for the OU2 facility are estimated at \$40,000 per month.

OU4 and OU5: Buildings and Miscellaneous (Construction Complete)

The final cost for the abatement, demolition, and removal of remaining buildings, structures, USTs, ASTs, and miscellaneous items was \$1,089,382. Most of the cost specified in the ROD for “Common Items” also was part of this cost. It was estimated in the ROD that the cost for these activities would be \$941,000. The additional cost is attributable to additional work of excavating and breaking up concrete, removing and cleaning steel rail lines, and disposing of railroad ties. The ROD used estimates for tram and rail lines and ties based on those visible during on-site surveys; however, the majority of the rails and ties were buried beneath soil or debris. They were found during soil excavation. Additionally, the historic buildings did not have common footers as found today but used massive concrete footings. In addition, concrete footings from buildings no longer in existence were discovered throughout the site. Thus, the estimate of 1,900 cubic yards of concrete foundations presented in the ROD was low. The final volume of concrete sent for recycling was approximately 3,600 cubic yards.

7 Cost and Performance Summary

Table 7-1 Final Construction Cost

Date	Contract	Amendment/ Work Order	Description of Work Completed	Cost
1/9/2003	FLS-9303	Amendment #7	Demolition & Removal of Remaining Buildings, Structures, USTs, ASTs, etc. (OU4 and OU5)	\$1,089,382
3/13/2003	FLS-9303	Amendment #8	Demolition & Removal of Remaining Buildings, Structures, etc. (OU4)	
11/4/2004	FLS-9303	Amendment #11	PCP Process Area HRC® Injections (OU3)	\$24,200
9/6/2005	HW-6303	Work Order #2	Disposal of Hazardous Soil from North Side & Work in PCP Process Area (OU1)	\$3,649,338
7/23/2007	HW-6303	Work Order #19	Remediation of South Side Soils and Completion of Areas Except for the Jennite® Pit, the 22nd St. Lagoon and Quadrants Adjacent to the 22nd St. Lagoon (OU1)	\$2,896,058
6/26/2008	HW-6303	Work Order #27	Remediation of South Side (OU3)	\$7,654,569
12/16/2008	HW-6303	Work Order #35	Remediation of South Side, Including the 22nd Street Lagoon & Jennite Pit (OU1)	
3/30/2009	HW-6303	Work Order #40	Remediation of South Side, Including the Remaining Quadrants, Area H & 22nd Street Rail Crossings (OU1)	
5/20/2009	HW-6303	Work Order #41	Construction of OU2 facility, HRC® Injections & Additional Excavation Work in PCP Area (OU2 and OU3)	\$2,587,202
Total Cost				\$17,900,749

Table 7-2 ROD Cost Estimate

Alternative	Capital Costs	Present Worth PRSC* Costs	Estimated Total Present Worth Cost
OU1: Removal and Disposal of Hazardous Wastes	\$400,000.00	N/A	\$400,000.00
OU1: Landfarm	\$1,481,000.00	\$1,762,000.00	\$3,243,000.00
OU2: Hot Water and Steam Flushing	\$1,309,000.00	\$2,117,000.00	\$3,426,000.00
OU3: Enhanced In Situ Bioremediation	\$349,000.00	\$2,151,000.00	\$2,500,000.00
OU4: Building Abatement and Demolition	\$219,000.00	N/A	\$219,000.00
OU5: Removal of Miscellaneous Items	\$145,000.00	N/A	\$145,000.00
OU4 and OU5: Common Items	\$577,000.00	N/A	\$577,000.00
Total Cost	\$4,480,000.00	\$6,030,000.00	\$10,510,000.00

* Post Remedial Site Control

An annual discount rate of 5% was assumed for calculating present worth cost.

8

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Record Drawings

State of Illinois Licensed Professional Engineer-sealed copies of the Jennison-Wright Corporation Remedial Action Design Sheets 1 through 8, prepared by Ecology & Environment Engineering, Inc. are on file at EEI offices located at 33 West Monroe, Suite 550, Chicago, Illinois 60603. The drawings were sealed by Neil J. Brown on December 19, 2008, License No. 062-055898, expiration November 30, 2009.



A. Record Drawings